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(54) IMPROVEMENTS IN OR RELATING TO ELECTRICALLY INSULATING PIPE COUPLINGS

(71) We, ZIEFLE AG, of Glattlerweg 12, CH-8598 Spreitenbach, Switzerland, a Swiss body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to electrically-insulating pipe couplings.

Such couplings may consist of an outer, tubular socket member and a first pipe portion having, respectively, flange and collar portions protruding radially in different radial directions and between the adjacent end surfaces thereof, directed transversely of the pipe portions, a flange at the end of the second pipe portion directed radially outwards, and between the end surfaces of this flange and the end surfaces of the flange of the first pipe portion and of the collar of the tubular socket member, in which there is mounted a pressure-resistant insulating ring, the insulating ring mounted to face the root of the socket ring being surrounded by two rubber-elastic O-rings carried in annular grooves in the adjoining surfaces of the flanges, as primary packing, and in which a chamber, which is closed at its two ends by the two opposed surfaces, in an axial direction, of the two insulating rings, there is mounted a rubber-elastic ring as secondary packing and in which moreover the pipe portions are secured in a condition of compression together by a welded seam on the socket part.

The manufacture of such pipe couplings, in which the encased rubber-elastic ring of the secondary packings is inserted before effecting the welded seam, in a pre-shaped, cross-sectional form, requires very considerable pressure, under which the securing weld is effected. It is then necessary, on the inserted moulding of the secondary packing, to fill up all the air cavities in the chamber, thus making sure that no electric flashover takes place at these critical positions. This means, however, that the uncompressed rubber moulding inserted in the chamber, before the weld is effected, has to be so heavily stressed that the small edges and cavities have to be filled by means of a local flow of rubber. This calls for a very great deforming force and this has to be taken into account in the calculation of the static forces on the other parts of the structure. The parts of the pipe coupling joint, therefore, have to be held together with very high prestressing force during welding, and this calls for considerable outlay on mechanical devices of high efficiency.

The invention is concerned with the provision of a simplified method of making such an electrically-insulating pipe coupling which, without detriment to the insulating and sealing properties of the finished product, requires no more than a small fraction of the compressive forces heretofore needed to force together the parts of the coupling to be connected by means of a securing or bracing weld, and which therefore involves much reduced technical complications. The invention accordingly provides a method of making an electrically-insulating coupling joint between adjacent ends of two pipe sections, each pipe section having at the said end thereof an outwardly extending flange forming with the pipe section an end face having an annular groove containing a resilient sealing ring, a first of the flanges extending outwardly beyond the second of the flanges, the method having the steps of locating a first insulating ring between the two end faces, locating a second insulating ring on the annular end face of the second flange, locating a tubular member around the first flange with an inwardly extending collar portion of the tubular member engaging the second insulating ring, fixedly securing the first flange and the tubular member together with the tubular member and the two flanges urged together to compress the sealing rings, filling the annular space between the tubular member, the second flange and the first and second insulating rings with a liquid compound arranged to set to a solid electrically-insulating mass, and filling the annular gap between the tubular member and the pipe section with the second flange with a settable electrically insulating material.

The liquid compound, being poured in, effects the required filling without the application of external pressure. Since only a very slight deformation force is needed for deforming the two resilient sealing rings, the prestressing pressure, under which the structure has to be kept during the welding of the bracing seam, is very low, and does not represent a burden which has to be taken into account for both the manufacture and the technical outlay needed for the purpose. Very great rated widths can be pre-stressed with the application of very slight force. It is even possible to dispense with hydraulic devices and to provide separate mechanically-acting devices, so that several joints can be assembled and welded at the same time.

It has been found desirable for technical reasons relating to the assembly, to locate the welded bracing seam between the outer edge of the outer surface of the first flange and the adjacent edge of the inner surface of the free end of the tubular member which has so far not been used. For the settable liquid compound constituting a secondary packing, it is possible to use with advantage a silicone rubber compound, for example, with the addition of a hardener as a two-component substance which is poured initially in liquid form, and then according to the nature of the reactive additive hardens in a given time interval, for example ranging from a few minutes to a few hours, to form an elastically rigid rubber substance. The invention will be readily understood from the following illustrative description and the accompanying drawing, the single figure of which is a diagrammatic helf-sectional view of a pipe coupling completed by a method in accordance with the invention.

The drawing shows pipe portions 1 and 2 connected by the coupling of the invention. On a flange 3 extending radially outwardly from the pipe portion 1 there is welded, as explained in detail below, a socket member 4 which has at its free end a collar 5 protruding radially inwardly. The other pipe portion 2 has an end flange 6, protruding radially outwardly, which is received between the flange 3 and the collar 5 of the socket member. On each side of the flange 6 and in engagement with it are two pressure-resistant insulating rings 7 and 8. Each ring 7, 8 consists, for example, of plastics impregnated (laminated) hard fabric or tissue, or hard paper. The insulating ring 7 carries on each side a rubber O-ring 9 which lies in a respective annular groove 10 in the flange 3 and the flange 6. The depth of the grooves 10 is chosen so that the rubber O-rings 9 are just deformed by axial pressure when the flange 6 is forced against the flange 3. The O-rings 9 form a reliable seal and constitute primary packing. Beyond the peripheral limiting surface of the flange 6 and parallel to its axis, opposed and slightly rounded surfaces of the two insulating rings 7 and 8 define the ends of an initially empty chamber 11 which is further defined between the inner flange 6 and the outer socket member 4. At an upper position of this chamber 11, which encircles the whole joint, the socket member 4 has a filling aperture 12 for the injection of a secondary sealing compound, an initially liquid rubber compound which hardens subsequently to form an elastic solid substance.

The assembly of the illustrated insulating coupling joint is effected firstly by inserting one O-ring 9 in the annular groove 10 in the flange 3 of the pipe portion 1. The insulating ring 7 is then placed on the flange 3. Next, the second O-ring 9 is inserted in the annular groove 10 of the flange 6 of the inner pipe portion 2 and this pipe portion is placed against the end of the insulating ring 7. The second insulating ring 8 is then located on the end of the flange 6 and the hitherto separate socket member 4 is located with its sealing collar 5 on the outside.

The pipe portions 1 and 2 are now forced under slight pressure in an axial direction, so that the O-rings 9 are compressed in the annular grooves 10 to form a circular seal with the insulating ring 7. While maintaining this slight axial pressure, a bracing or securing weld 13 is formed between the assembled parts of the joint at the extremity of the flange 3. To facilitate this, recesses are formed at the outer edge of the flange 3 remote from the ring 7 and at the adjacent inner edge of the socket member 4. In these recesses the welded seam can be reliably placed. Completion of the weld fixes the length of the electrically-insulating and sealing joint.

Now follows the introduction of the secondary packing into the chamber 11. For this purpose there is poured through the filling aperture 12 a liquid rubber compound, for example, a compound made of silicone rubber with the addition of a hardener. This two-component compound in the liquid state fills the chamber 11 as well as any gaps at the connecting surfaces, and forms, after the subsequent setting process due to the reaction of the components, a solid rubber elastic substance which reliably insulates from one another metal parts of the joint of different potential, and by the elimination of any cavities also prevents the occurrence of dangerous glow discharges or flashover. After the consolidation of the rubber compound, which is poured in without the application of pressure, the filling aperture 12 is sealed by a plug (not shown). Moreover, an annular opening 14 at the free end of the joint between the collar 5 and the pipe portion 2 is grouted in the usual way with epoxy resin. The joint, which is now completed, is coated as is usual, with an epoxy bitumen protective layer.

The finished joint is a robust convenient

unit free from screws, bolts or the like which can be installed in any desired dimension as electrical insulating protection in pipes. Owing to its compact design it is largely impervious to corrosive influences.

WHAT WE CLAIM IS:—

1. A method of making an electrically-insulating coupling joint between adjacent ends of two pipe sections, each pipe section having at the said end thereof an outwardly extending flange forming with the pipe section an end face having an annular groove containing a resilient sealing ring, a first of the flanges extending beyond the second of the flanges, the method having the steps of locating a first insulating ring between the two end faces, locating a second insulating ring on the annular end face of the second flange, locating a tubular member around the first flange with an inwardly extending collar portion of the tubular member engaging the second insulating ring, fixedly securing the first flange and the tubular member together with the tubular member and the two flanges urged together to compress the sealing rings, filling the annular space between the tubular member, the second flange and the first and second insulating rings with a liquid compound arranged to set to a solid electrically-insulating mass, and filling the annular gap between the tubular member and the pipe section with the second flange with a settable electrically-insulating material.

2. A method as claimed in claim 1, wherein the first flange and the tubular member are fixedly secured together by welding a bracing seam therebetween whilst simultaneously urging the tubular member and the two flanges together by applying thereto an axial force to compress the sealing rings.

3. A method as claimed in claim 2, wherein the bracing seam is welded between the outer edge of the outer surface of the first flange and the adjacent edge of the inner surface of the previously free end of the tubular member.

4. A method as claimed in claim 1, 2 or 3, wherein the settable liquid compound is a silicone rubber including a hardener.

5. A method as claimed in any preceding claim, wherein the settable liquid compound, poured into said space in the liquid state and then set on cooling, substantially entirely fills the whole of said space available to it.

6. A method of making an electrically-insulating coupling joint substantially as herein described with reference to the accompanying drawing.

7. An electrically-insulating coupling joint made by the method of any preceding claim.

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1437587 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*